Webinar – Ductwork airtightness:
Standardisation's on- going work and an overview of status and trends in Sweden, Japan, Spain and Portugal

25 January 2018

TightVent® Europe
BUILDING AND DUCTWORK AIRTIGHTNESS PLATFORM

AIVC
AIR INFILTRATION AND VENTILATION CENTRE


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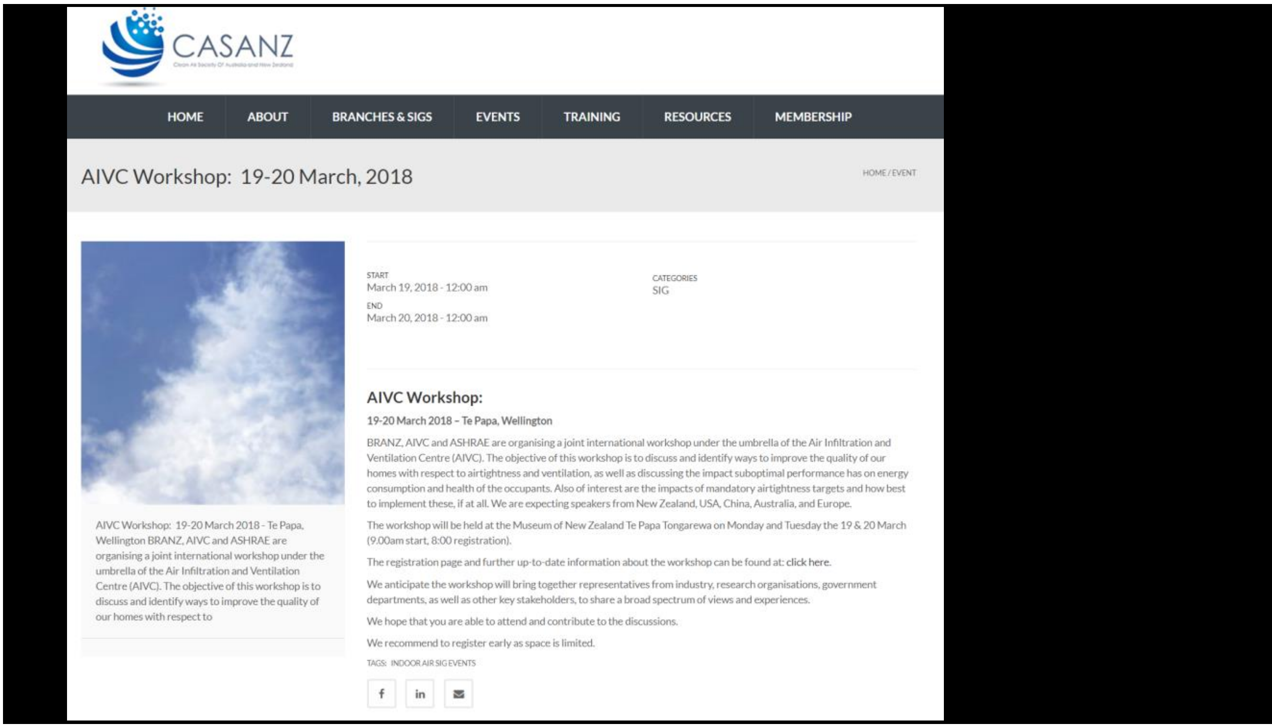
18-19 September 2018, Antibes Juan-Les-Pins Conference Centre, Antibes Juan-Les-Pins, France
236 DAYS 8 HOURS 47 MINUTES 6 SECONDS



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AIVC Workshop: 19-20 March, 2018

HOME / EVENT

AIVC Workshop: 19-20 March 2018 - Te Papa, Wellington BRANZ, AIVC and ASHRAE are organising a joint international workshop under the umbrella of the Air Infiltration and Ventilation Centre (AIVC). The objective of this workshop is to discuss and identify ways to improve the quality of our homes with respect to

START
March 19, 2018 - 12:00 am
END
March 20, 2018 - 12:00 am

CATEGORIES
SIG

AIVC Workshop:

19-20 March 2018 – Te Papa, Wellington

BRANZ, AIVC and ASHRAE are organising a joint international workshop under the umbrella of the Air Infiltration and Ventilation Centre (AIVC). The objective of this workshop is to discuss and identify ways to improve the quality of our homes with respect to airtightness and ventilation, as well as discussing the impact suboptimal performance has on energy consumption and health of the occupants. Also of interest are the impacts of mandatory airtightness targets and how best to implement these, if at all. We are expecting speakers from New Zealand, USA, China, Australia, and Europe.

The workshop will be held at the Museum of New Zealand Te Papa Tongarewa on Monday and Tuesday the 19 & 20 March (9.00am start, 8:00 registration).

The registration page and further up-to-date information about the workshop can be found at: click here.

We anticipate the workshop will bring together representatives from industry, research organisations, government departments, as well as other key stakeholders, to share a broad spectrum of views and experiences.

We hope that you are able to attend and contribute to the discussions.

We recommend to register early as space is limited.

TAGS: INDOOR AIR SIG EVENTS

Agenda for this webinar

- **Ductwork Airtightness: Why Should We Care?**
  - Valérie Leprince, PLEIAQ , France
- **Status of Ductwork Airtightness in Japan and on-Going Work at ISO on Ductwork Airtightness**
  - Masaki Tajima, KUT, Japan
- **European Ductwork Airtightness Classes, on-Going Standardization Work and Status in Sweden**
  - Lars-Åke Mattsson, CEN/TC 156/WG3, Sweden
- **Market Trends in Spain and Portugal. An Industry Point of View**
  - Rodrigo Sanz, Gonal Driving Air, Spain

Why should we care about ductwork airtightness ?

Webinar on ductwork airtightness
January 25th, 2018
Valérie Leprince, PLEIAQ

Outline

- Impact of ductwork leakages
- Ductwork airtightness level
- Evolution in regulatory and programme requirements in EU countries
- Presentation of speakers

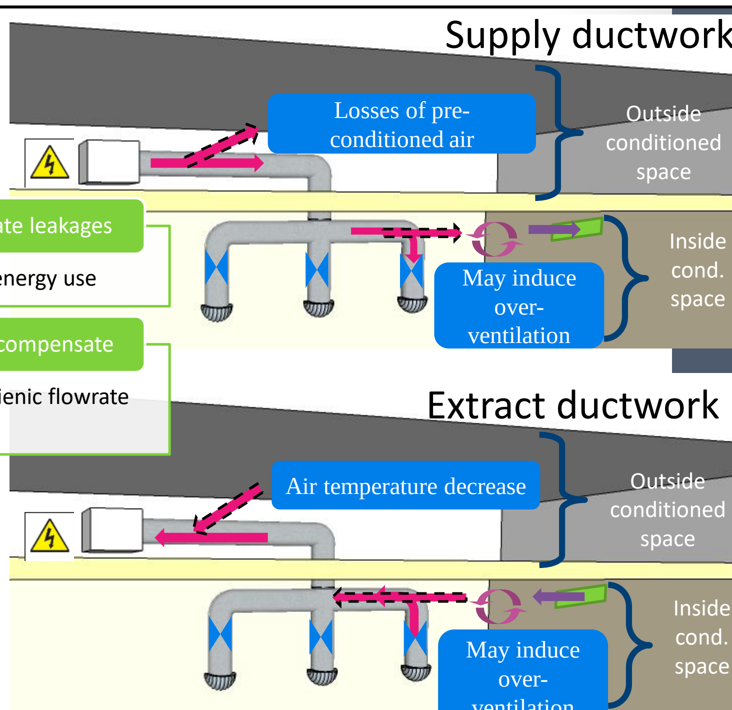
IMPACT OF DUCTWORK LEAKAGES

The fan compensate leakages

- Increase of fan energy use

The fan does not compensate

- Decrease of hygienic flowrate
- Decrease of IAQ



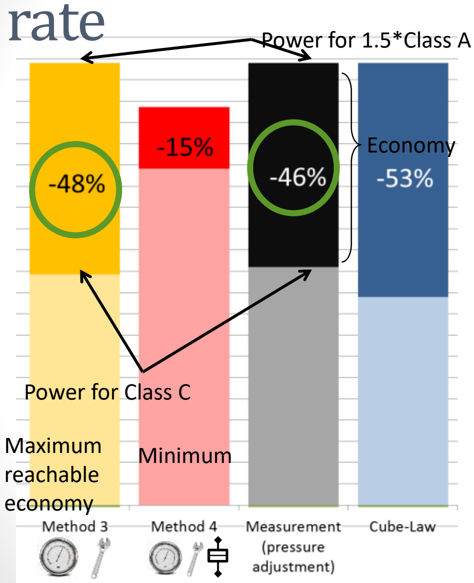
Fan energy use, test on laboratory replication of real ductwork system

- Area 18.7 m²
- Extract fan constant pressure
- 8 self- adjusting air terminal devices
- Airflow rate:
  - Max : 525 m³/h
  - Min : 260 m³/h
- Measurement and calculation method

Class C → Drilling → 1.5 *Class A

Source : (Berthault, Boithias, & Leprince, 2014)

Results for maximum airflow rate



- Decrease leakages from 1,5 class A to Class C can almost **divide Fan energy use by 2**

Source: Leprince, Carrié, AIVC 2017

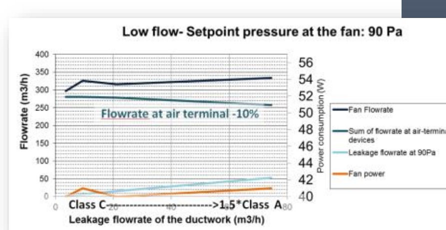
Energy use impacts

- Impact on overall building energy use:
  - According to (Soenens, 2011) the total energy consumption related to ventilation can **be reduced by over 30%** by achieving an airtight ventilation system.
  - According to (Dyer, 2011) in a pharmaceutical plant over a 30 years life of the building the energy **penalty** associated with excessive duct leakage is **more than 1.3 million dollars**

=> More studies on the impact on heating and cooling are needed

IAQ impacts

- Duct leakage:
  - Reduces flowrates at air terminal devices, unless fan compensates
    - A decrease of 10% of flowrate has been observed by (Berthault, 2014) if the fan is not re-adjusted
  - Suspicions:
    - Increases dust accumulation in filters, heat exchangers, ducts, …
    - Weakens contamination protection of sensitive areas (operating theatres, clean rooms, etc.)

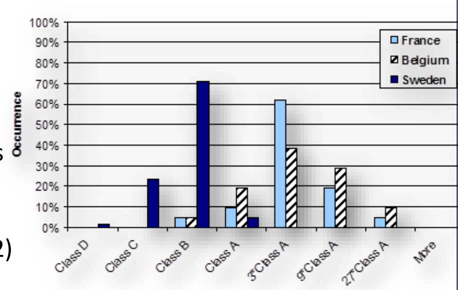


=> More studies on this field are needed

DUCTWORK LEAKAGE LEVELS

Ductwork leakage levels

- SAVE-DUCT project has shown striking difference between Sweden, Belgium and France (Carrié, 1999)
  - In **Sweden,** since 1966, the AMA tightness requirements have been raised to reach **Class C** for every ductwork since 2007 (Andersson, 2012)
- In US: duct leakage in 11 large buildings shown to represent on average **28% of the fan flow** (Modera, 2013)



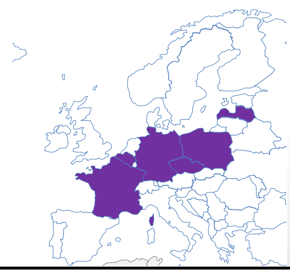
EVOLUTION IN REGULATORY OR PROGRAMME REQUIREMENTS

Evolution in regulatory or programme requirements

- In **Sweden** ductwork airtightness is required
  - Since 1966
  - Since 2007: **Class C** required
- In **Portugal** for large building
  - Since 2006 ductwork leakage below **1.5 l/s.m² under 400 Pa**
- In **Belgium**
  - Taken into account in calculation method, but no minimum requirement
- In **UK**
  - **Test mandatory** for system with design flows **> 1 m³/s**
  - For low pressure ducting no test required but taken into account in calculation
  - Test typically performed by ducting contractor
- In **France**
  - Since 2013
  - Effinergie + label requires **Class A**
  - Test has to be performed by a **qualified** independent **technician**

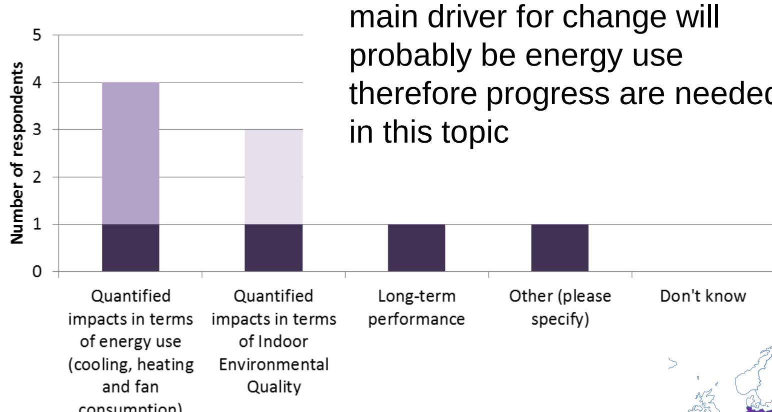
How ductwork airtightness is taken into account in regulations?

- Result of a Tightvent Airtightness Association Committee (TAAC) survey
  - Only France (RT2012) and Belgium (EPB) consider ductwork airtightness as an input in EP-regulation
    - But there is no minimum requirement
    - In France if a value better than default value is used then it has to be justified (testing or certified quality approach)
  - Awareness is low

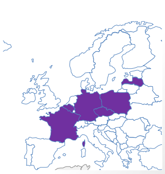


Source Leprince, Carrié, Kapsalaki, AIVC 2017

What is in your view the progress needed to promote ductwork airtightness in your country?



- As for building airtightness the main driver for change will probably be energy use therefore progress are needed in this topic



PRESENTATION OF SPEAKERS

Ductwork airtightness: standardisation's ongoing work and an overview of status and trends in Sweden, Japan, Spain and Portugal

Lars-Ake Mattsson

- CEN TC 156/WG3, Sweden
- European ductwork airtightness class, on-going standardization work and status in Sweden

Masaki Tajima

- KUT, Japan
- Status of ductwork airtightness in Japan and on-going work at ISO on ductwork airtightness

Rodrigo Sanz

- Gonal Driving Air, Spain
- Market trends in Spain and Portugal, an industry point of view

EUROPEAN DUCTWORK AIRTIGHTNESS CLASSES.

ON-GOING STANDARDIZATION WORK AND STATUS IN SWEDEN

Lars-Åke Mattsson:
Convener TC156 WG3 “Ducts”
R&D manager Lindab
Tightvent Europe webinar, 25 January 2018

The big perspective

Goals

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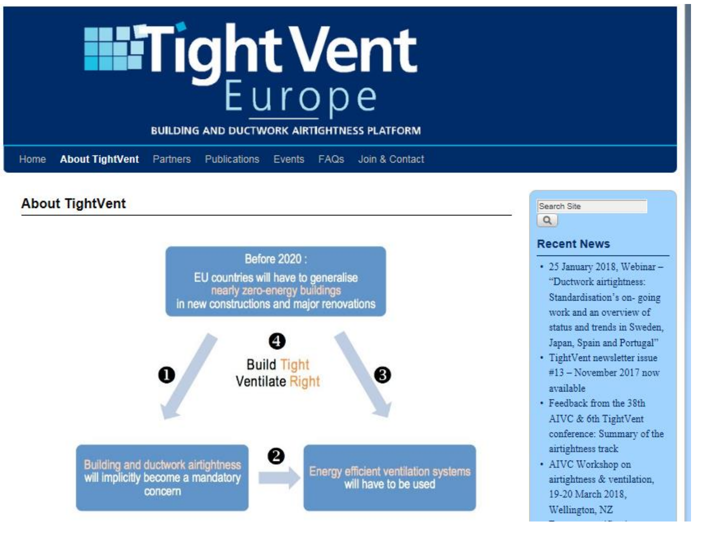
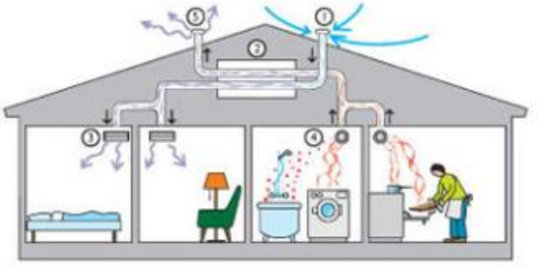
Research findings



Mechanical supply and exhausted ventilation with heat recovery



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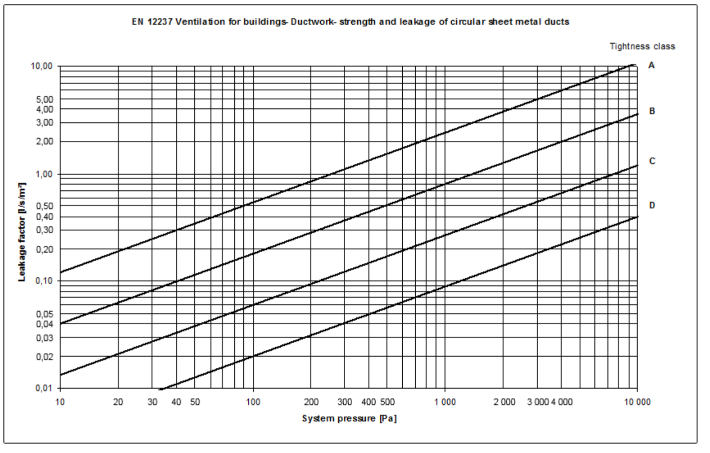
Airtightness in ventilation ducts what is it?

Airtightness diagram



Tightness class diagram

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EN 14239 Surface area

Dimensions in millimetres

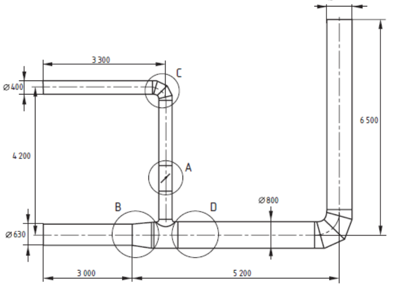

Figure 2 – Example of typical installation of ductwork with circular cross section

Table 1 – Example of calculation of duct surface area for circular ducts

Diameter mm	Duct surface area [a] per unit length m²/m	Length m	Total duct surface area m²
800	2,51	6,5 + 5,2	2,51 × 11,7 = 29,4
630	1,98	3,0	1,98 × 3,0 = 5,9
400	1,26	4,2 + 3,3	1,26 × 7,5 = 9,5
Total for installation shown in Figure 2			44,8

[a] From Table A.1

System test

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History

History

1960

* Wallin, O: „Täthetsförändringar hos ventilationskanaler" Tekniska meddelanden 139 från Instituionen för Uppvärmings- Ventilationsteknik, KTZ Stockholm.
Pettersson, F.: „Behövs en ändrad täthetsnorm för ventilationssystem" Tekniska meddelanden 164 från Institutionen för Uppvärmings- och Ventilationsteknik, KTH Stockholm.

SIS 827209

1972
1975

Ventilationskanaler av stålplåt
Hållfasthet och täthet

SVENSK STANDARD SIS 82 72 09
Utgåva 1
Sida 2

2.3 Läckflöde

Läckflödet (luftläckningen) q får vid av fabrikanten angiven täthetsklass A eller B – inte överstiga i tabell 2 angivna värden i l/s och m² mantelyta hos kanalen vid ett provtryck (övertryck) av 1 kPa.

Tabell 2

Täthetsklass	A	B
Högsta tillåtna läckflöde q i l/s och m² vid 1 kPa	2,4	0,8

Angivna värden på läckflödet q överensstämmer med motsvarande värden i VVS-AMA 72.

Eurovent 2/2

2.2 For normal ventilating and airconditioning installations, three classes of air tightness, A, B, and C have been chosen for which the upper limits of $f \cdot p_{sm}^{-0.65}$ are represented by:

$$K_A = 0{,}027 \cdot 10^{-3} ms^{-1} \cdot Pa^{-0{,}65}$$
$$K_B = 0{,}009 \cdot 10^{-3} ms^{-1} \cdot Pa^{-0{,}65}$$
$$K_C = 0{,}003 \cdot 10^{-3} ms^{-1} \cdot Pa^{-0{,}65}$$

1981

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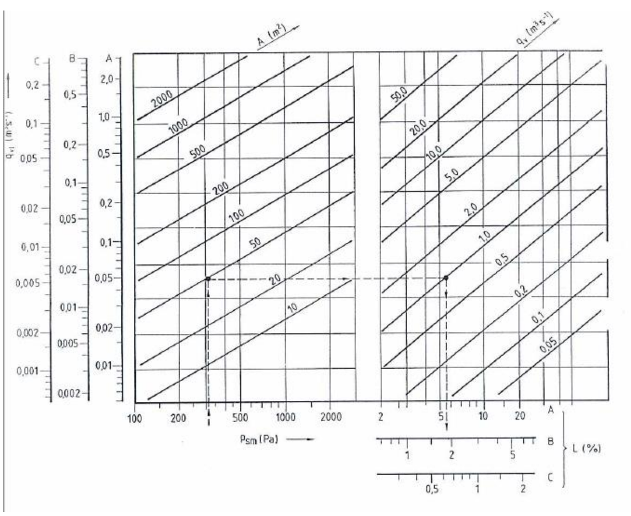
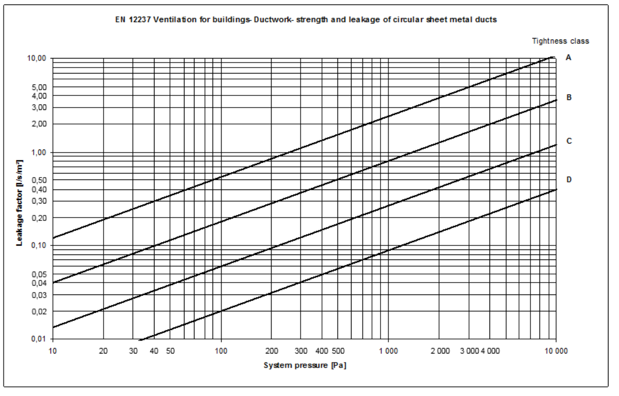
Eurovent 2/2



EN standards



Tightness class diagram

2003

Third party certification

Swedish Type approval

Eurovent Certification

Requirements from other standards

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EN 13779 Performance requirements (Old EPBD)

A.8.2 Selection of airtightness class

The minimum airtightness class is selected according to the following principles. However, a more strict class is applied in cases where the total area of the casing is exceptionally large in relation to the total airflow, where the pressure difference across the casing is exceptionally high, or when exceptional problems result from leakage because of the demands on air quality, risk of condensation or any other reason. EN 15242 gives methods to estimate the energy impact of air leakages and further advise on selection of aitightness classes for ductwork and air handling units.

The air leakage of enclosed air-handling units, and equipment rooms and chambers for fans and other assemblies should not exceed the leakage according to class A (corresponds class L3 for air handling units, EN 1886) in Figure A.3.

Class B is the general minimum requirement for air ducts, and also the minimum for all exhaust air ducts subject to overpressure inside the building, excluding plant rooms.

Class C is the recommended minimum class in many cases, especially if the pressure difference across the duct casing is high, or if any leakage can result in a hazard to the indoor air quality, control of pressure conditions or functioning of the system.

Class D is applied in special situations, and also applicable for cases described above for Class C, especially in installations with high hygiene requirements or with special attention to energy performance.

EN 16798-3 Performance requirements (New EPBD)

6.9.4 Leakages at air ducts

The classification and testing of airtightness of round ducts are defined in EN 12237, of rectangular ducts in EN 1507.

To reduce energy losses and to guarantee the planned air distribution, this value shall be minimum class B. Class C is recommended.

EN 15780 Cleanliness

F.3 Application of cleanliness levels - airtightness

The airtightness of the ductwork is also important for cleanliness. Leakages in unclean hollow spaces or suspended ceilings can have a big influence to the indoor air quality, especially for the advanced level. The minimum recommended tightness class related to these cleanliness levels can be expressed as follows, corresponding with the technical recommendations of EN 13779:2007, A.8.2,

Table F.3 — Recommended minimum tightness class

Level	Recommended minimum tightness class
Basic	B
Intermediate	C
Advanced	D

Table A.1 — Typical applications of cleanliness quality classes

Quality Class	Typical examples
Low	rooms with only intermittent occupancy e.g. storage rooms, technical rooms
Medium	offices, hotels, restaurants, schools, theatres, residential homes, shopping areas, exhibition buildings, sport buildings, general areas in hospitals and general working areas in industries
High	Laboratories, treatment areas in hospitals high quality offices

EN 12599 Handing over

Table 1 — Summary of tests, measurements and report to verify the quality of the systems

Required Steps	Purpose	Activities	Annexes
<u>Step a</u> Completeness checks	To ensure that the ventilating and air conditioning system has been installed entirely in accordance with contract	1. Comparison of equipment with the installation list 2. Compliance with technical rules (contract and official) 3. Accessibility 4. Cleanliness 5. Balancing 6. Air tightness 7. Documents necessary for operating	Annex A With more specified information on the activities 1 to 7

— air tightness of ducts according to EN 13779,

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EN 12599 Handing over

Table 2 — Functional measurements

Measurement at		Total System	Central System/Appliance				Duct work	Room					
Parameters		Additional cleanliness test	Current drawn and power by the motor [D.6]	air flow *) [D.1]	air temperature *) [D.3]	pressure drop across filter [D.7]	ductwork leakage test [D.8]	supply air flow [D.1]	exhaust air flow [D.1]	supply air temperature **) and air temperature in the room [D.3]	air humidity [D.4]	sound pressure level [D.5]	Indoor air velocity [D.2]
Ventilation System	(F) Z	2	1	1	0	1	2	1	2	0	0	2	0
	(F) H	2	1	1	1	1	2	1	2	2	0	2	2
	(F) C	2	1	1	1	1	2	1	2	2	2	2	2
	(F) M/D	2	1	1	1	1	2	1	2	2	1	2	2
Partial air conditioning system	(F) HC	2	1	1	1	1	2	1	2	1	2	2	2
	(F) HM/HD/ CM/CD	2	1	1	1	1	2	1	2	1	1	2	2
	(F) MD	2	1	1	1	1	2	1	2	2	1	2	2
	(F) HCM/M CD/CHD /HMD	2	1	1	1	1	2	1	2	1	1	2	2
Air conditioning system	(F) HCMD	2	1	1	1	1	2	1	2	1	1	2	2

*) Outdoor air, supply and exhaust air
**) Depending on control principles, if relevant

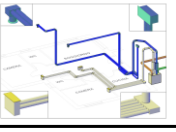
Explanations

0 measurement not necessary
1 to carry out in all cases
2 to carry out only in the case of contracted agreement

Different standards

Airtightness Standards to the environment

Airtightness Standards
Systems

	Dimensions	Strength and leakage
	EN 1506	EN12237
	EN 1505	EN 1507
	prEN 17192	prEN 17192

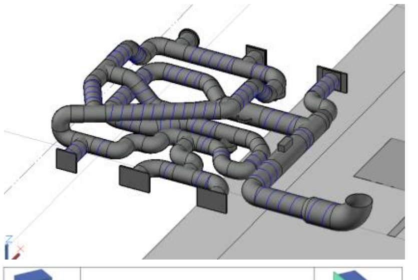
Differences
L/A ratio

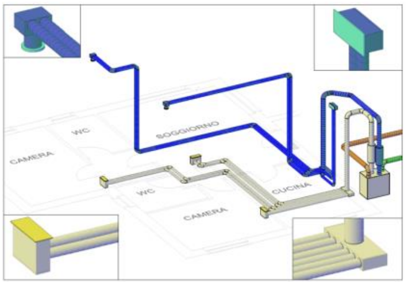
For rigid ductwork, L/As shall be:

$$1m^{-1} < \frac{L}{A_s} < 1{,}5m^{-1}$$

For semi-rigid ductwork, L/A shall be:

$$0{,}4m^{-1} < \frac{L}{A_s} < 0{,}6m^{-1}$$





Airtightness Standards Components

Dampers	EN 1751
Technical Components	EN 15727
Flexible ducts	EN 13180

Differences

Area calculation

Technical Components

7.2 Calculation of the total joint length (L)

The total joint length, in metres, for a product of circular cross-section is the sum of the joint perimeter of each connection (1 to n).

$$L = \pi \times (d_1 + d_2 + \dots d_n) \quad (1)$$

The total joint length, in metres, for a product of rectangular cross-section is the sum of each joint perimeter.

$$L = 2 \times (a_1 + b_1 + a_2 + b_2 + \dots a_n + b_n) \quad (2)$$

7.3 Calculation of the virtual product surface area (A_c)

The virtual product surface area A_c, in square metres, is:

$$A_c = L \times 0,5 \quad (3)$$

or

$$A_c = A_p \text{ (the product surface area)} \quad (4)$$

whichever is the larger.

Dampers

C.3 Casing leakage

The range of case leakage performance has been related to the general ductwork leakage classes as follows:

The reference casing area is taken as the perimeter of the damper multiplied by an equivalent length of 1 m.

Figure C.2 gives for classes A, B and C the permitted maximum case leakage q_{vLCA} in $1 \cdot s^{-1} \cdot m^{-2}$ as a function of duct static pressure p_s in Pa.

Flexible ducts

The leakage factor shall be determined by the air leakage rate divided by the surface area $\pi \cdot d_n \cdot L$ where L is the length of the reference test element and d_n is its nominal diameter.

Differences

Area calculation “1 meter duct”
Same theory in both EN 1751 and EN 15727

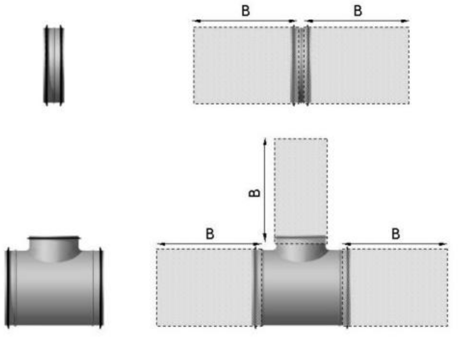


Figure 1. Virtual duct lengths B applied to circular slip-in joint and T-piece.

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Airtightness Standards Air Handling Units

Air Handling Units	EN 1886

Table 4 — Casing air leakage classes of air handling units, 400 Pa negative test pressure

Leakage class of casing	Maximum leakage rate (f_{400}) $l \times s^{-1} \times m^{-2}$	Filter class (EN 779)
L3	1,32	G1 to F7
L2	0,44	F8 to F9
L1	0,15	superior to F9

Airtightness Standards in field at the handing over process

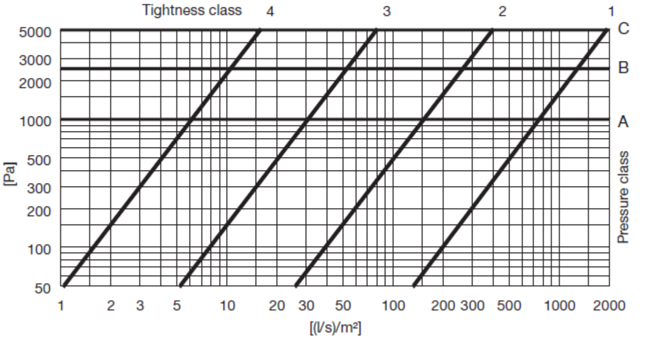
Handing over	EN 12599

Airtightness through damper blade Standards

Airtightness Standards
Through damper blade

Damper blades	EN 1751

Tightness past the closed damper blade and pressure classes



Pressure classification

Circular metallic duct classification

Table 2 – Ductwork Classification

Air tightness class	Static pressure limit (p_s) Pa		Air leakage limit (f_{max}) $m^3 \cdot s^{-1} m^{-2}$
	Positive	**Negative**	
A	500	500	$0{,}027 \cdot p_t^{0{,}65} \cdot 10^{-3}$
B	1 000	750	$0{,}009 \cdot p_t^{0{,}65} \cdot 10^{-3}$
C	2 000	750	$0{,}003 \cdot p_t^{0{,}65} \cdot 10^{-3}$
D [a]	2 000	750	$0{,}001 \cdot p_t^{0{,}65} \cdot 10^{-3}$

[a] Ductwork for special applications.

Rectangular metallic duct classification

Table 1 — Ductwork classification

Air tightness class	Air leakage limit (f_{max}) $m^3 \cdot s^{-1} \cdot m^{-2}$	Static gauge pressure limits (ps) Pa			
		Negative at all pressure classes	Positive at pressure class		
			1	2	3
A	$0{,}027 \times p_{test}^{0{,}65} \times 10^{-3}$	200	400		
B	$0{,}009 \times p_{test}^{0{,}65} \times 10^{-3}$	500	400	1 000	2 000
C	$0{,}003 \times p_{test}^{0{,}65} \times 10^{-3}$	750	400	1 000	2 000
D [a]	$0{,}001 \times p_{test}^{0{,}65} \times 10^{-3}$	750	400	1 000	2 000

[a] Ductwork for special application.

In field classification

D.8 Air leakage

D.8.1 Measuring method

The leakage measurements can be performed while the duct system is being installed.

As soon as a sufficiently large section of the air duct system has been installed, all openings are sealed off. A fan which is connected to the sealed duct system through an equipment for measuring is used to generate a test pressure difference above or below atmospheric pressure. The test pressure should be adjusted to one of the following values which should be chosen to be as near as possible to mean operating pressure of the system, preferably:

200 Pa, 400 Pa, or 1 000 Pa above atmospheric in case of supply air ducts or 200 Pa, 400 Pa or 750 Pa below atmospheric in case of exhaust air ducts.

If measurement equipment is used to verify tightness class A or B, it is possible that the above named pressure values could not be achieved at a greater ductwork surface area.

In this cases, the tightness class could be determine by a lower pressure, using the following formula to calculate the leakage airflow approximately:

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New standards

New non metallic ducts

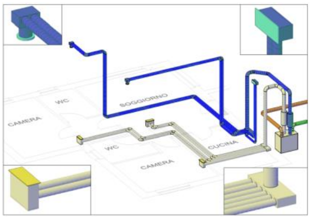
To small system

New shapes on ducts

New shapes on manifolds

Other criteria for pressure

L/A 1-1,5



solutions

To small system	at least 10 m2 or whole system
New shapes on ducts	measure the exact area
New shapes on manifolds	ad the whole surface of the cube or outline
Other criteria for pressure	Same idea as EN12599
L/A 0,4-0,6	Recommendation for supplier

US standards

lindab | we simplify construction

Comparison European US classes

Generally, the air tightness classes are applied by European Union (EU) member countries as listed in Table 12-4. For the United States, ASHRAE originally developed "Air Leakage Class (C_L)" to predict air leakage from round, rectangular, flexible, and fibrous glass duct using data from research conducted in 1985 (RP-308). Today, ASHRAE is using air leakage classes in the same manner as European countries. Figure 12-5 shows the relationship of European air tightness classes and leakage classes. The equivalency between EU and ASHRAE leakage classes is noted on these figures; namely, A (C_L=19), B (C_L=6.4), C (C_L=2.1), and D (C_L=0.7).

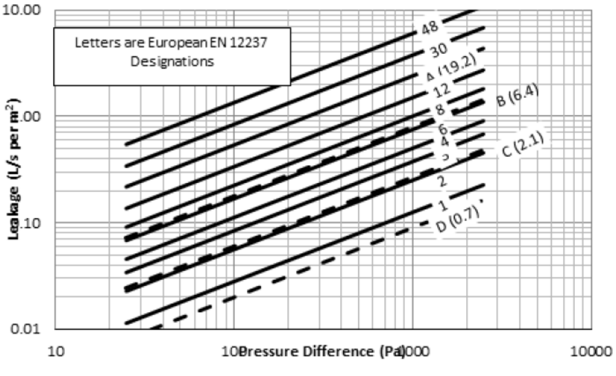


Figure 12-5. Relationship between European air tightness classes (dash lines) and ASHRAE leakage classes (solid lines) (SI units).

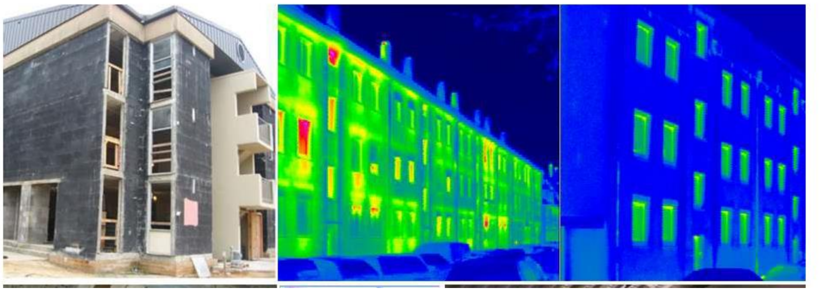
Source comparison

International Energy Agency

Deep Energy Retrofit

A Guide to Achieving Significant Energy Use Reduction with Major Renovation Projects

Annex 61, Subtask A



Sweden news

Study

BeBo ENERGIMYNDIGHETENS BESTÄLLARGRUPP FÖR ENERGIEFFEKTIVA FLERBOSTADSHUS

Tätning av ventilationskanaler

Förstudie inför teknikupphandling

Upprättad av

Katarina Högdal, WSP Environmental

2014-12-12

http://www.bebostad.se/library/1867/foerstudie-kanaltaetning.pdf

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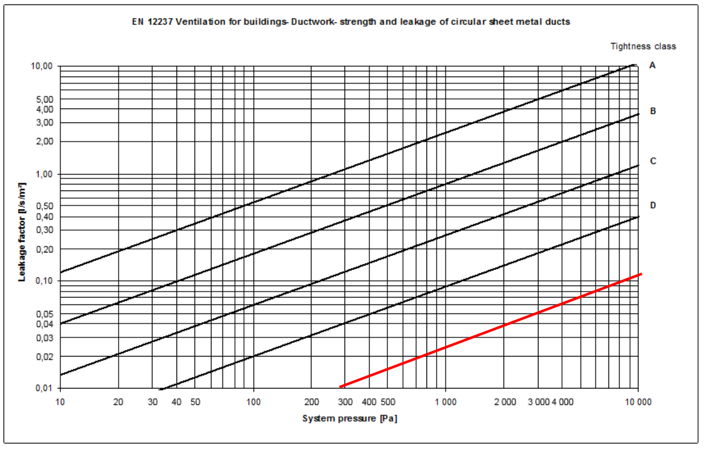
Class E



Tightness class diagram

Class E

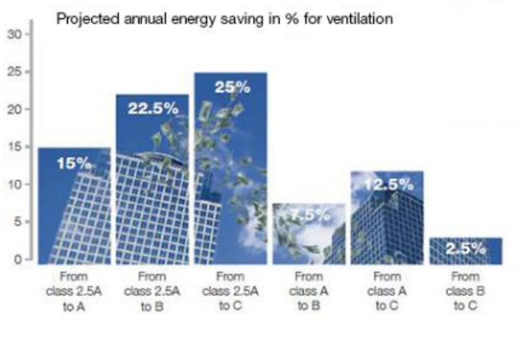
My wiev:

1. No demand from energy perspective.
2. Wet cleaning demand.
3. Problem with grease drips from factory processing.
4. Smell from garbage ventilation with over pressure.

2-3 should be solved by airtight or downpipe principle
4 should be solved by airtight or negative pressure.

Lindab duct leaking calcylator

https://www.lindqst.com/ads/calcleak/default.aspx



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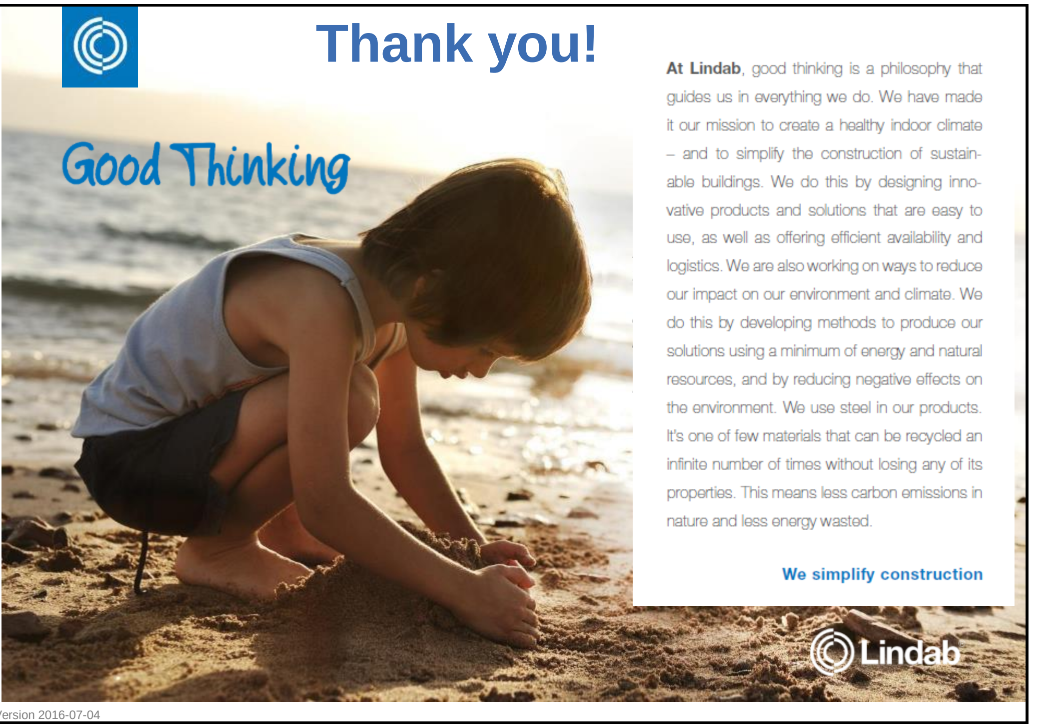


Version 2016-07-04

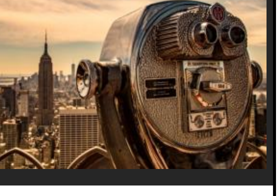
Status of Ductwork Airtightness in Japan and On-going Work at ISO on Ductwork Airtightness

Kochi University of Technology
Assoc. Prof. **Masaki TAJIMA**, PhD
tajima.masaki@kochi-tech.ac.jp

Contents

I. Status of Ductwork Airtightness in Japan
   1. Building Standard Law
   2. Building Energy Efficiency Act
   3. Discussion

II. On-going Works
   1. Works at ISO/TC163/SC1/WG10
   2. Ductwork Airtightness



Contents

Status of Ductwork Airtightness in Japan
Building Standard Law

- The Building Standard Law
  - is the mandatory and primary law concerning building codes
  - requires minimum standards concerning the site, construction, equipment and use of buildings

Reference: Introduction to the Building Standard Law, www.bcj.or.jp

- About airtightness related in ductworks
  - In an Order for Enforcement of the Standard, airtightness of Fire dampers is required

No requirement on airtightness of ductworks

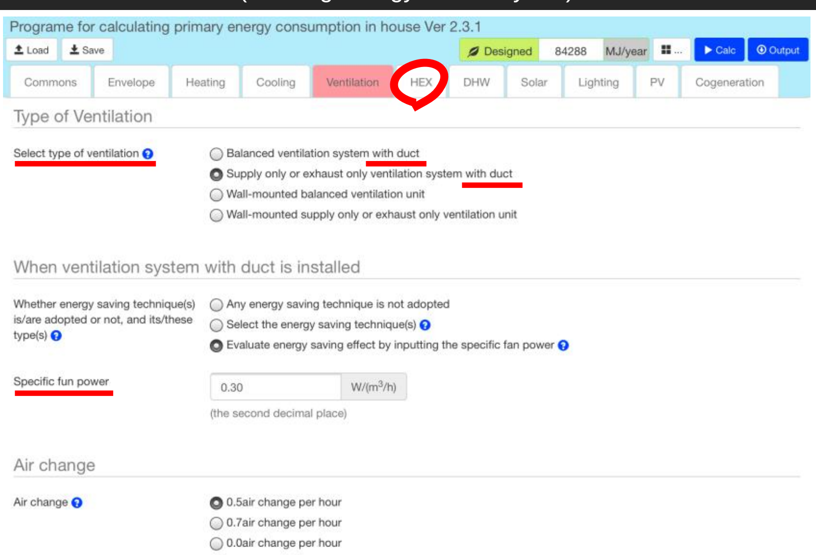
Status of Ductwork Airtightness in Japan
Building Energy Efficiency Act

- Standards of the Act
  - Calculation of envelope performance and primary energy consumption amount targeting for newly built buildings is required
  - The calculation is executed in design term
  - It becomes full obligation in 2020

Reference: www.mlit.go.jp/common/001134876.pdf

- About airtightness related in ductworks

Status of Ductwork Airtightness in Japan
Official Program for Calculating Primary Energy
(Building Energy Efficiency Act)



Reference: house.app.lowenergy.jp

Status of Ductwork Airtightness in Japan
Building Energy Efficiency Act

- Standards of the Act
  - Calculation of envelope performance and primary energy consumption amount targeting for newly built buildings is required
  - The calculation is executed in design term
  - It becomes full obligation in 2020

Reference: www.mlit.go.jp/common/001134876.pdf

- About airtightness related in ductworks

No requirement even on airtightness of building

No requirement on airtightness of ductworks

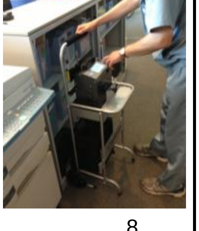
Status of Ductwork Airtightness in Japan
Discussion : What makes the present situation

Design term

- Building Standard Law & Building Energy Efficiency Act
- by MLIT (Ministry of Land Infrastructure, Transport and Tourism)

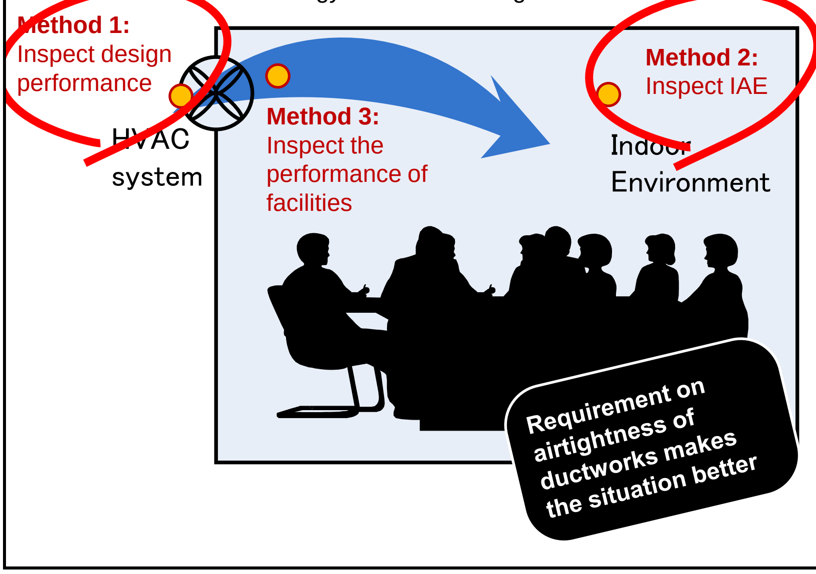
Operation term

- Act on Maintenance of Sanitation in Buildings
- by MHLW (Ministry of Health Labour and Welfare)
  - Measurement of indoor air environment has to be executed every 2 months or more
  - Floor area of target building is greater or equal to 3,000m^2

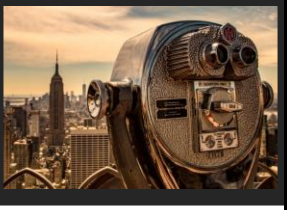


Status of Ductwork Airtightness in Japan
Discussion : Summary

- How to achieve energy conservation & good IEA



Contents



On-going Works
Works at ISO/TC163/SC1/WG10

1.Measurement of airtightness of building
 1) High-rise building > under discussion
 2) Large building > the proposal from USA

2.Air tightness of building elements and assemblies
 1) Ducts > under discussion
 2) Barrier assemblies > ISO14857-2014
 3) Partition, etc.

3.Evaluation of the measurement of airtightness
 1) Uncertainties > under discussion

4.Measurement of ventilation rate
 1) Multizone ventilation

TC163: Thermal performance and energy use in the built environment
SC1: Test and measurement methods
WG10: Air tightness of buildings

On-going Works
Ductwork Airtightness

Ductworks

1) Status
   a) ASTM, CEN and northern European countries have related regulations with the brief description on measurement procedures

2) Importance
   a) To indicate the leak positon of the ventilation system
   b) To improve the airtightness of the building

3) Tasks to be settled
   a) Overviewing the status in terms of the codes and the regulations
   b) Practical measuring system, procedures, etc. should be shown

On-going Works
Ductwork Airtightness

Accumulating Knowledge

Products

- Duct, components and so on
- Measurement instruments

Standards

- ASTM E1554
- EN 1509
- EN 12237
- EN14239
- EN 15727
- and so on

Lectures

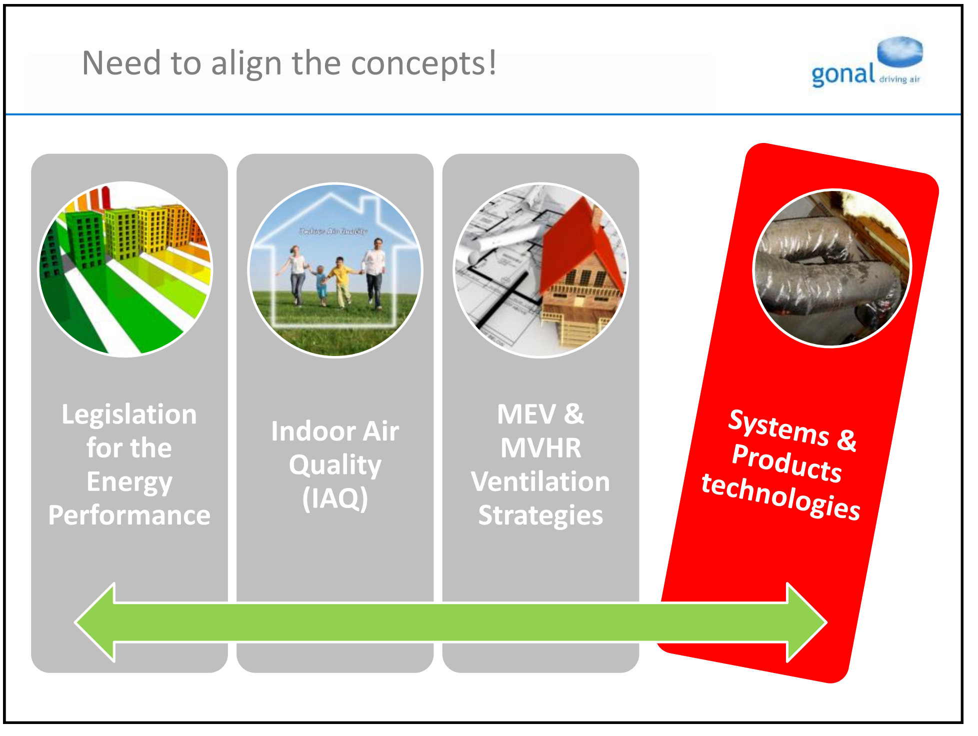
MARKET TRENDS IN SPAIN & PORTUGAL

AN INDUSTRY POINT OF VIEW

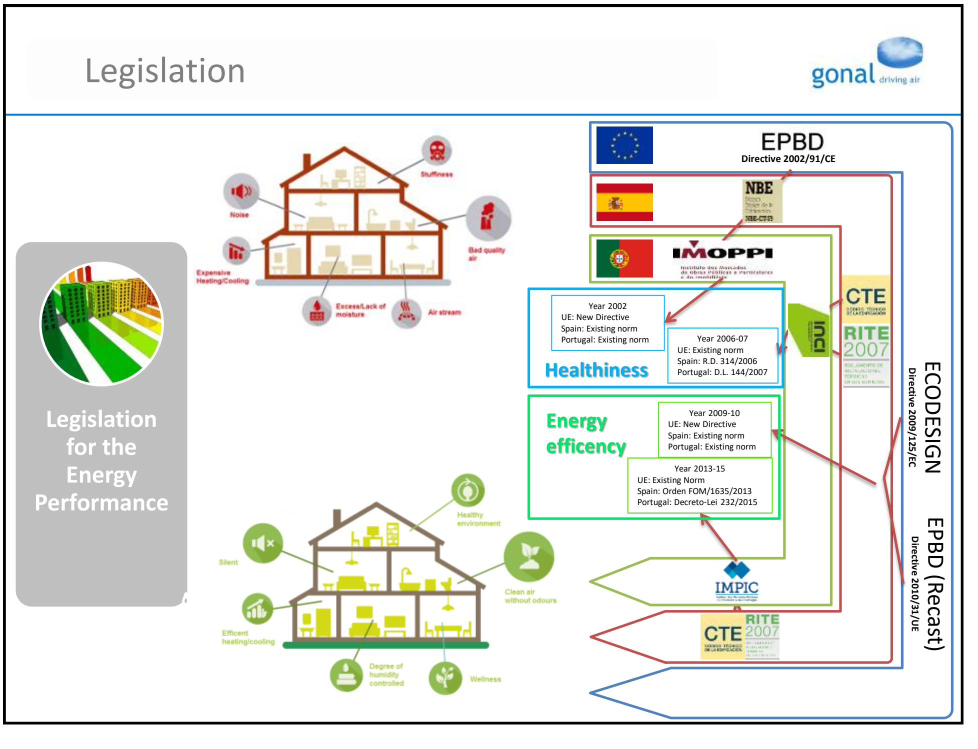
Webinar of Ductwork airtightness, 25/01/2018
Rodrigo Sanz

Introduction

- Since 1986 in Barcelona
- Our group
  - Plastic Ductwork
  - Ventilation Systems
  - Metallic Ductwork
- Members of
- Integration in Technical Comitee in



Need to align the concepts!
gonal driving air
Legislation for the Energy Performance
Indoor Air Quality (IAQ)
MEV & MVHR Ventilation Strategies
Systems & Products technologies



Legislation
gonal driving air
Legislation for the Energy Performance
Stuffiness
Noise
Bad quality air
Expensive Heating/Cooling
Excess/Lack of moisture
Air stream
Healthy environment
Silent
Clean air without odours
Efficent heating/cooling
Degree of humidity controlled
Wellness
EPBD
Directive 2002/91/CE
NBE
IMOPPI
Year 2002
UE: New Directive
Spain: Existing norm
Portugal: Existing norm
Year 2006-07
UE: Existing norm
Spain: R.D. 314/2006
Portugal: D.L. 144/2007
Healthiness
Energy efficency
Year 2009-10
UE: New Directive
Spain: Existing norm
Portugal: Existing norm
Year 2013-15
UE: Existing Norm
Spain: Orden FOM/1635/2013
Portugal: Decreto-Lei 232/2015
CTE
RITE 2007
IMPIC
ECODESIGN
Directive 2009/125/EC
EPBD (Recast)
Directive 2010/31/UE

IAQ

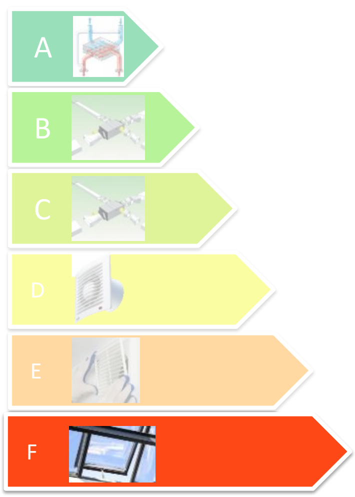
Indoor Air Quality (IAQ)

Healthy homes in air tight buildings

CO_2 [ppm]	Air Quality
2100	
2000	
1900	
1800	
1700	
1600	
1500	
1400	
1300	
1200	
1100	
1000	
900	
800	
700	
600	
500	
400	

Ventilation Strategies

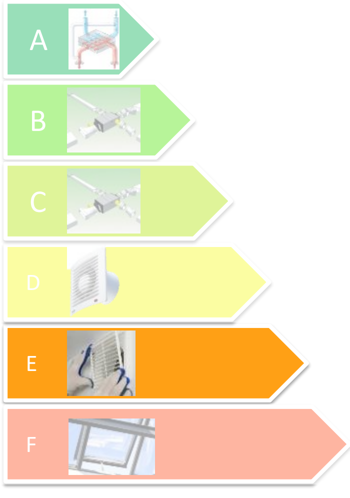
MEV & MVHR Ventilation Strategies



Windows

Ventilation Strategies

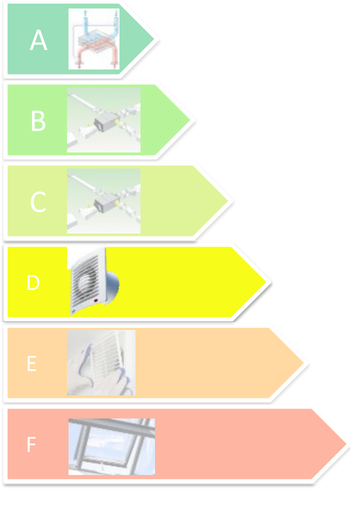
MEV & MVHR Ventilation Strategies



Grilles

Ventilation Strategies

MEV & MVHR Ventilation Strategies

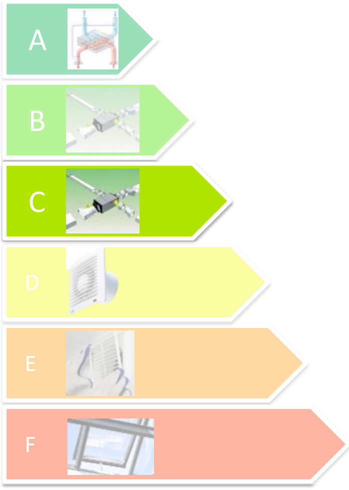


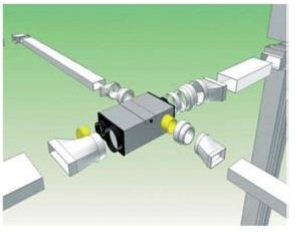
Extract Fan

Ventilation Strategies

gonal driving air

MEV & MVHR Ventilation Strategies



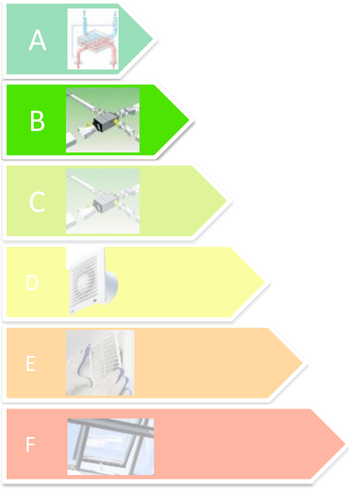


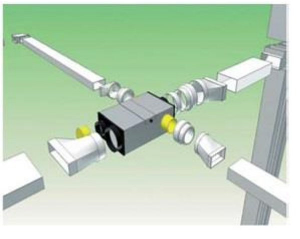
Self-Balanced Ventilation System

Ventilation Strategies

gonal driving air

MEV & MVHR Ventilation Strategies





Humidity –Sensitive Ventilation System

Ventilation Strategies

MEV & MVHR Ventilation Strategies

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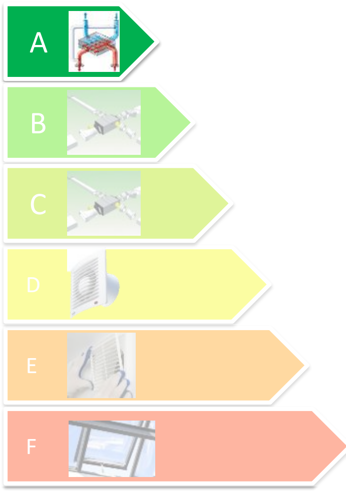
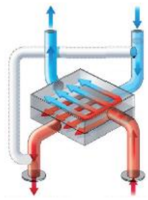
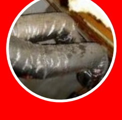


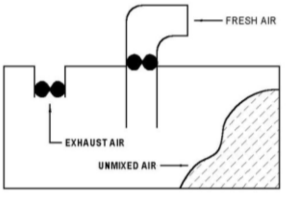


Heat-Recovery Ventilation System

Systems & Products Technologies



Systems & Products technologies



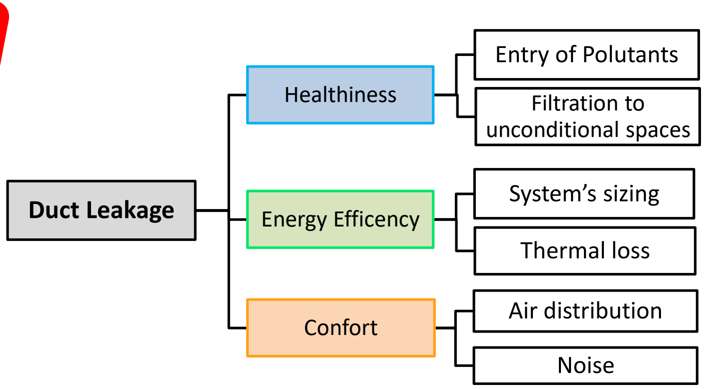
- **Poorly designed air distribution systems**

Systems & Products Technologies

- **Poorly installed air distribution system or bad product choice**

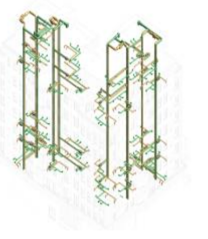
Systems & Products Technologies

- **Leakage consequences**



Best practises are needed

gonal driving air

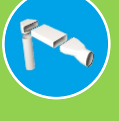


- **BEST PRACTISE design principles to minimise pressure loss**

- **BEST PRACTISE installing principles to avoid leakage in connections**

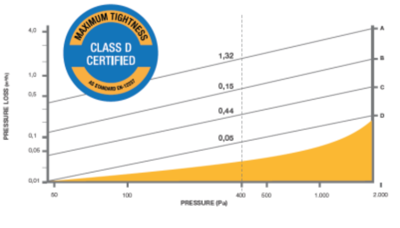
We offer solutions in plastic ductwork systems
Tubpla® Pure StancoFix

gonal driving air



Tubpla® ductwork technology

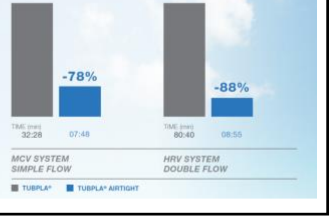
- **Integrated air-tight seals**
- **Mechanical connections**



- **Extremely Airtight Class D according to EN 12237**

- **Extremely easy and quick to install**

Cost saving



GONAL® contributes to energy efficiency

Benefits for better practise of Tubpla®Pure StancoFix

- The widest range of plastic air-tight mechanical connections ductwork.

Tubpla® ductwork technology

> AIR FLOW:

	SYSTEM 150	SYSTEM 125	SYSTEM 100
SIZES (mm)	Ø 150 180x90	Ø 125 220x55	Ø 100 110x55
FLOWS (m³/h) maximum*	240	180	90
minimum**	150	100	50

* Air speed = 4.0 m/s
** Air speed = 2.5 m/s

- **Antibacterial and Antistatic duct!**
- Preventing diseases
- Avoiding dust embeded into the duct and preserving stocked ducts

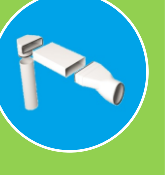
GONAL® contributes to energy efficiency

Tubpla® Airtight Pure, integrating value in the concepts!

Legislation for the Energy Performance

Indoor Air Quality (IAQ)

MEV & MVHR Ventilation Strategies



Tubpla® ductwork technology

…, bitting for a better practise

Thank you!